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## ABSTRACT

This document presents the findings from a task force whose charge was to compare the expectations postsecondary institutions have of their entering freshmen with the proficiencies expected of Indiana high school students and to develop recommendations for reducing whatever gaps might exist between the two. These recommendations take the form of messages that the task force believed were appropriate for a variety of audiences--primarily young people in the seventh and eighth grades, their parents, teachers of mathematics, and school counselors. The messages describe the importance of mathematics for college and career decisions and the topics that should be mastered in an appropriate sequence of high school mathematics courses. Included are four sections: (1) "Introduction"; (2) "Mathematics Topics"; (3) "Occupations"; and (4) "Areas of Study." (KR)

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RECOMMENDATIONS FROM TASK FORCE ON MATHEMATICS

(Decision Item)

February 10, 1989

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## COMMISSION FOR HIGHER EDUCATION

Friday, February 10, 1989

### DECISION ITEM B: Recommendations from Task Force on Mathematics

#### Staff Recommendation

- (1) That the Commission accept the recommendations from the joint Department of Education/Commission task force on mathematics.
- (2) That the Commission direct its staff to proceed with a plan of action as described in the accompanying documents.

#### Background

In October, 1987, the Commission appointed higher education faculty to a Task Force on Mathematics that was jointly sponsored by the Commission and the State Department of Education. The charge to the task force was to compare the expectations postsecondary institutions have of their entering freshmen with the proficiencies expected of Indiana high school students, and to develop recommendations for reducing whatever gaps might exist between the two. The group met several times during the 1988-89 school year and completed its recommendations in April, 1988.

These recommendations take the form of messages that the task force believed were appropriate for a variety of audiences — primarily young people in the seventh and eighth grades, their parents, teachers of mathematics, and school counselors. The messages describe the importance of mathematics for college and career decisions, and the topics that should be mastered in an appropriate sequence of high school mathematics courses.

In December, the Commission heard a presentation from the task force's chairman and briefly discussed an action plan for following up on what the task force has accomplished. That same plan is recommended for adoption today.

#### Supporting Documents

- (1) "Action Plan for Following Up the Recommendations of the Task Force on Mathematics." November 11, 1988
- (2) "Mathematics Preparation for Continued Education and/or Career," no date
- (3) Mathematics Task Force Membership List

## **ACTION PLAN FOR FOLLOWING UP THE RECOMMENDATIONS OF THE TASK FORCE ON MATHEMATICS**

December 9, 1988

In April, 1988, the joint Department of Education/Commission Task Force on Mathematics completed its work and submitted a series of recommendations. These took the form of messages addressed to several audiences — young people in the seventh and eighth grades, their parents, mathematics teachers, and school counselors. The messages described the importance of an understanding of mathematics for college and career decisions, and the topics that should be mastered in an appropriate sequence of high school mathematics courses.

The dissemination of these messages and the fostering of appropriate action can take many forms. The Commission for Higher Education proposes to:

1. Work with the Indiana College Placement and Assessment Center to incorporate appropriate messages into its communications with ninth grade pupils and their parents.
2. Work with the Task Force on Mathematics to develop a plan for the implementation of task force recommendations.
3. Invite the Indiana Conference on Higher Education to declare as a goal that after 1995 postsecondary mathematics courses below a certain level will no longer confer college credit.
4. Consider a tuition discount for high school graduates who have completed a prescribed mathematics curriculum.

**MATHEMATICS PREPARATION FOR  
CONTINUED EDUCATION AND/OR CAREERS**

**Recommendations from the 1987-88  
Task Force on Mathematics**

- I. Introduction**
- II. Mathematics Topics**
- III. Occupations**
- IV. Areas of Study**

April, 1988

## Mathematics Preparation for Continued Education and/or Career

### I. Introduction

Have you chosen a career? Do you plan to continue your formal education after high school? Do you know what mathematics you will need in order to pursue your career or college plans? The Task Force on Mathematics of the Commission for Higher Education wants to help Indiana students, parents, teachers, and counselors understand the importance of mathematics for students' post-high school plans.

There are two factors to be emphasized in considering the mathematics you will need. First, you need to decide what courses to take. Your high school may offer many different mathematics courses, but if you think you might want to go to a four-year college or a two-year technical college, you should plan to take "college preparatory" mathematics such as algebra, geometry, and other advanced courses. Even if you have no idea whether or not you'll go to college, or what your career will be, taking these courses will keep all doors open for you. Set your sights high.

The second factor is even more important. While colleges and employers may ask you what courses you have taken, they are far more interested in knowing what mathematics you have **LEARNED**. It is absolutely critical that you learn well what is taught. Studying mathematics for four years without learning it is more of a problem than not taking the courses.

Colleges and employers frequently test their potential students or employees to see just how much mathematics they really can use effectively. Most high schools have competent, highly-qualified mathematics teachers to guide students through a course of study that will prepare them for post-high school mathematics. High school students do not always master this pre-college curriculum. Serious high school mathematics students will spend five to ten hours per week on homework, will not have an unnecessary part-time job, and will attend school on a very regular basis.

High school graduates who haven't mastered their mathematics courses often find themselves having to pay to take those courses over again, sometimes not even earning college credit for them. That's expensive! It's also unnecessary. Make sure you put the most effort possible into mastering the mathematics taught in your high school courses. And, here's a final work: Plan to take some mathematics in your senior year. Then it will be fresh in your mind when you are getting started in college or on the job.

## II. Mathematics Topics

Before you take college preparatory mathematics courses, you should be proficient in working with and applying whole numbers, fractions, decimals, integers, and percentages. Students who did not master these skills in elementary school and junior high may have to begin high school by taking such courses as general mathematics, applied mathematics, and introductory algebra.

Once you have begun your college preparatory mathematics courses, you need to concentrate on understanding the mathematics you are learning. Don't just learn WHAT to do. Find out WHY something works, HOW to use it, and WHEN to use it. Concentrate on developing your problem-solving and thinking skills, because these are the skills that will be the most valuable to you in the future.

During your first two years of college preparatory mathematics, you should learn to understand these basic algebraic and geometric topics:

- linear equations
- systems of equations
- integer exponents
- special products and factoring
- properties of geometric figures in two and three dimensions
- applying formulas for perimeters, areas, volumes, and surfaces
- inductive and deductive reasoning
- congruence and similarity

You should also be introduced to quadratic equations, polynomial functions, rational expressions, graphs of functions, linear inequalities, radicals, probability, and statistics.

The third year of college preparatory mathematics builds on the skills you will have learned in the first two years. When you have finished the third year, you should thoroughly understand these topics:

|                                       |                                    |
|---------------------------------------|------------------------------------|
| quadratic equations                   | polynomial functions               |
| rational expressions                  | graphs of functions                |
| fractional exponents                  | logarithms                         |
| exponential and logarithmic equations | arithmetic and geometric sequences |
| the binomial theorem                  | infinite geometric series          |
| linear and quadratic inequalities     | radicals                           |
| probability and statistics            | conic sections                     |

Your choice of courses for your fourth year of college preparatory mathematics will depend upon your goals after high school. If you study trigonometry, you should understand trigonometric functions and their graphs, degree and radian measures, trigonometric identities and equations, and inverse trigonometric functions and their graphs. Another fourth-year course is analytic geometry, which covers conic sections, polar coordinates, transformations, and vectors. Still other fourth-year possibilities are probability and statistics, discrete mathematics, or a full-year college-level calculus course.

### III. Occupations

Did you know that almost any career choice you might make will require a solid foundation in high school mathematics? You have already heard that students who are interested in science and engineering need to understand as much mathematics as possible. You will probably be surprised to learn that three years of college preparatory mathematics are recommended for students interested in art, music, laws, business, agriculture, and many other fields.

To begin the mathematics required in your four-year college program, or in the job training required by your technical college or by your employer, you will need more mathematics than you might realize. You will need a thorough understanding of

at least two years of high school mathematics to successfully take college courses leading to a job as a ...

law enforcement officer  
bank teller  
postal clerk  
machinist  
brick layer  
dental assistant  
cabinet maker  
construction worker

fire fighter  
hotel desk clerk  
electrician  
carpenter  
beautician  
medical assistant  
plumber

at least three years to successfully take college courses leading to a job as a ...

automotive service technician  
electronics technician  
heating/air conditioning technician  
computer programmer  
draftsman  
home economist  
dental hygienist  
forestry aide  
dietitian  
nurse  
medical secretary

environment technician  
industrial/medical lab technician  
mental health worker  
accountant  
teacher  
pharmacist  
sociologist  
physical therapist  
photographer  
social worker

You will need at least four years of high school mathematics if you wish to successfully take college courses leading to a job as an ...

airline pilot  
physician  
political scientist  
engineer  
statistician  
astronomer  
economist  
meteorologist

veterinarian  
medical researcher  
biochemist  
geologist  
chemist  
mathematics teacher  
computer scientist

#### IV. Areas of Study

Listed below are many areas in which you might study after high school. Each of these majors requires at least two years of college preparatory mathematics. Many require more mathematics as indicated.

Two years of college preparatory mathematics

##### Arts

Art  
Film/Television  
Music  
Theater Arts

##### Business

Business Education  
Office Administration

##### Social Sciences

Anthropology

Three Years of college preparatory mathematics

##### Agriculture

Agriculture Business/Economics  
Agriculture Education  
Animal Science Production  
Entomology  
Environmental Science  
Farm Management  
Forestry  
Industrial Arts  
Landscaping Horticulture  
Land Resources  
Mechanized Agriculture  
Plant Pathology  
Plant Protection  
Plant/Soil Sciences  
Rural Sociology  
Wildlife Ecology

##### Home Economics

Home Economics Education/Extension  
Service  
Inst. Food Services  
Nutrition Management

##### Humanities

English  
History  
Modern Languages  
Philosophy  
Speech/Communication

##### Business

Computer Operations  
Distributive Ed  
Finance/Economics  
Management/Marketing

##### Education

Elementary  
Secondary  
Physical Education  
Health, Recreation

##### Home Economics

Business  
Child Development (2 yrs)  
Food Sciences

**Humanities**

Linguistics

**Medicine**

Allied medicine

Dental Hygiene

Four years of college preparatory mathematics.

**Architecture**

Architecture

**Business**

Accounting

**Sciences\***

Actuarial Sciences

Astronomy

Bacteriology

Biochemistry

Biology

Chemistry

Computer Sciences

Environmental Health

Genetics

Geography/Earth Sciences

Geology

Geophysics

Mathematics

Medical Technology

Meteorology

Microbiology

Physics

Statistics

**Social Sciences**

Black Studies

Geography

Political Sciences

Sociology

Social Justice Welfare

**Engineering\***

Engineering

Engineer Technology

**Medicine**

Biomed Science

Dentistry

Nursing

Optometry

Pharmacy

Pre-Law

**Social Sciences**

Psychology

\*A fifth year of mathematics (calculus) is recommended.

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